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(54) **LED TUBE SOCKET, ADAPTOR AND ASSEMBLY THEREOF**

(2013.01); *H01R 31/06* (2013.01); *F21K 9/17* (2013.01); *F21S 2/00* (2013.01); *F21S 4/008* (2013.01); *F21V 21/005* (2013.01); *F21V 23/06* (2013.01); *F21Y 2101/02* (2013.01); *F21Y 2103/003* (2013.01)

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(58) **Field of Classification Search**

CPC ..... *F21Y 2103/003*; *F21S 4/008*; *F21V 23/06*  
USPC ..... 362/219, 217.17  
See application file for complete search history.

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(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 234 days.

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(21) Appl. No.: **13/708,406**

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(51) **Int. Cl.**

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*F21V 19/00* (2006.01)  
*F21K 99/00* (2010.01)  
*F21S 2/00* (2006.01)  
*F21V 21/005* (2006.01)  
*F21V 23/06* (2006.01)  
*H01R 31/06* (2006.01)  
*F21Y 101/02* (2006.01)  
*F21Y 103/00* (2006.01)

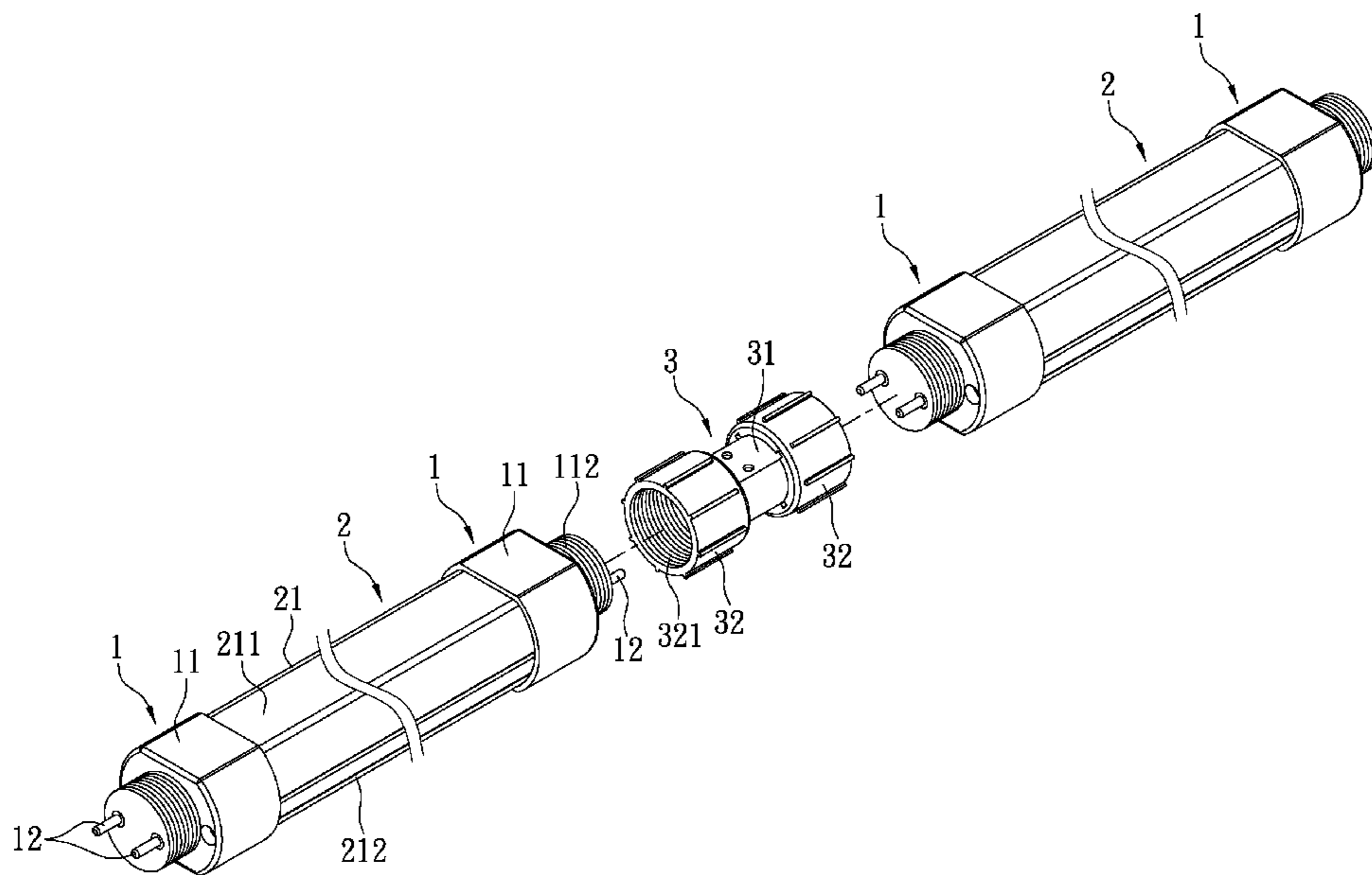
(57) **ABSTRACT**

A Light Emitting Diode (LED) tube socket, an adaptor and an assembly thereof, which includes two sockets capping either end of a LED tube. Each of the sockets has a socket main body, a pair of conductive terminals and a first threaded portion. The pair of the conductive terminals is disposed in the socket main body and electrically connecting a first LED assembly within the socket main body. The socket connects the adaptor via the threaded portions and the seal is water-tight. Two or more LED tubes are connected thereby to satisfy a required length.

(52) **U.S. Cl.**

CPC ..... *F21S 8/00* (2013.01); *F21V 19/009*

**8 Claims, 8 Drawing Sheets**



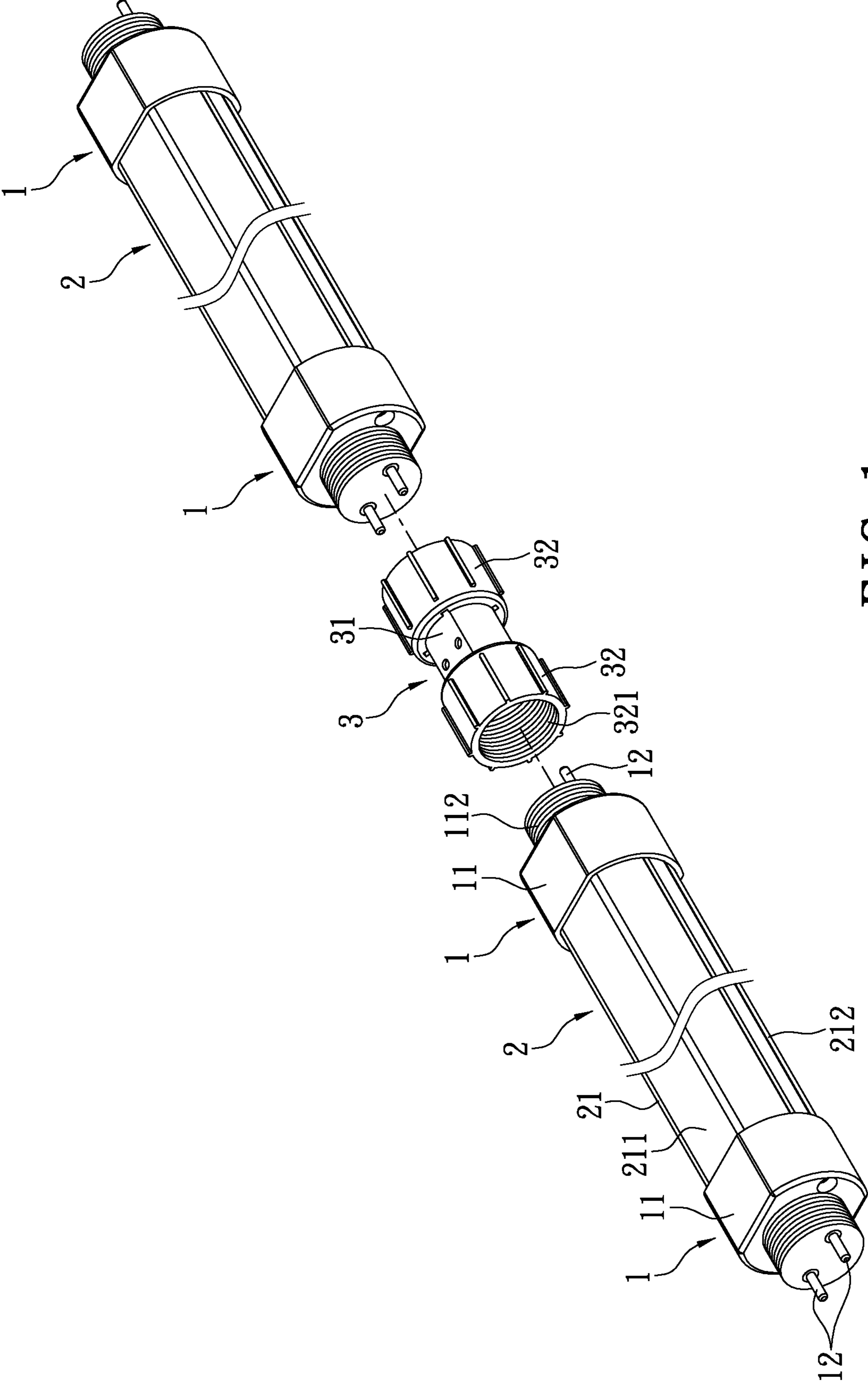


FIG. 1

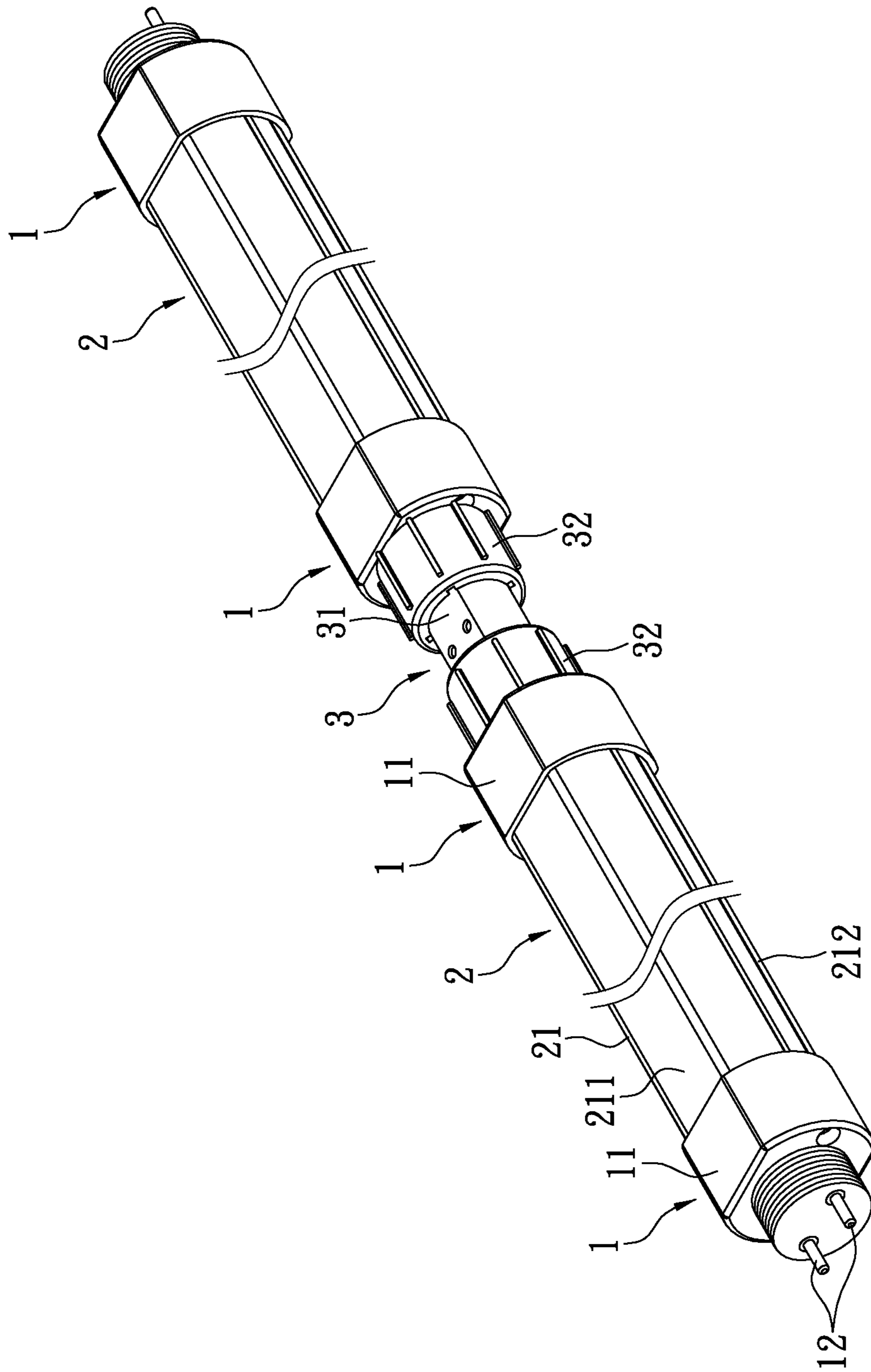


FIG. 2

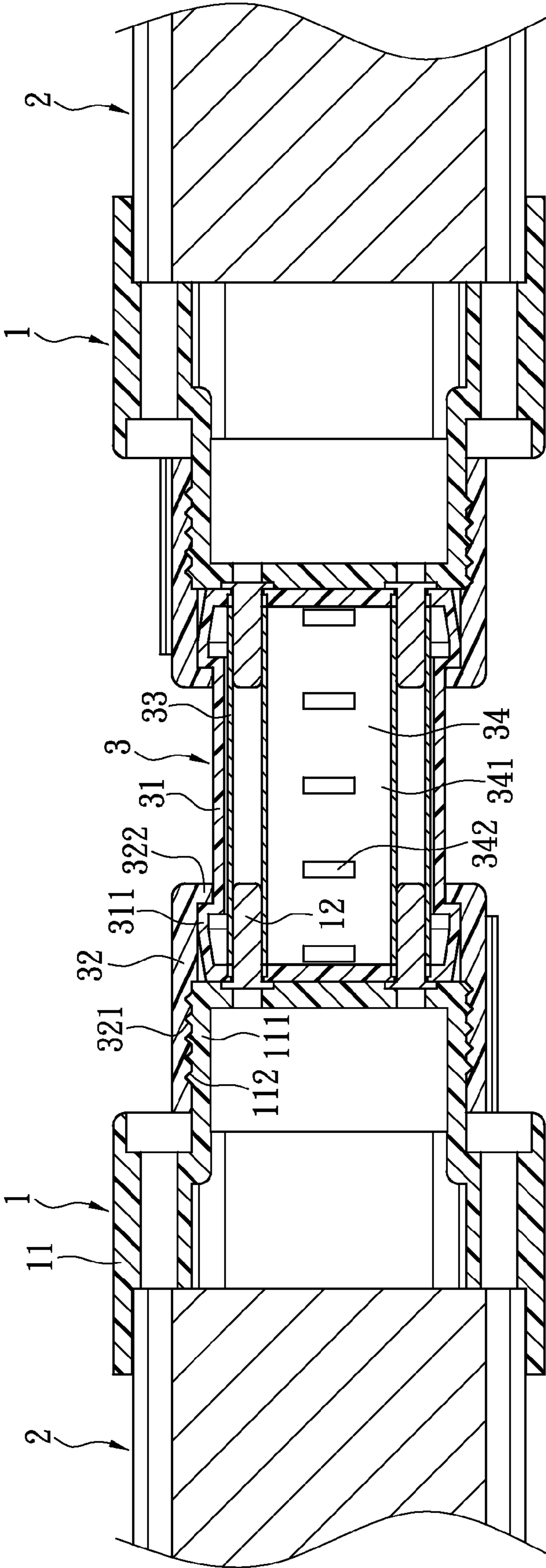


FIG. 3

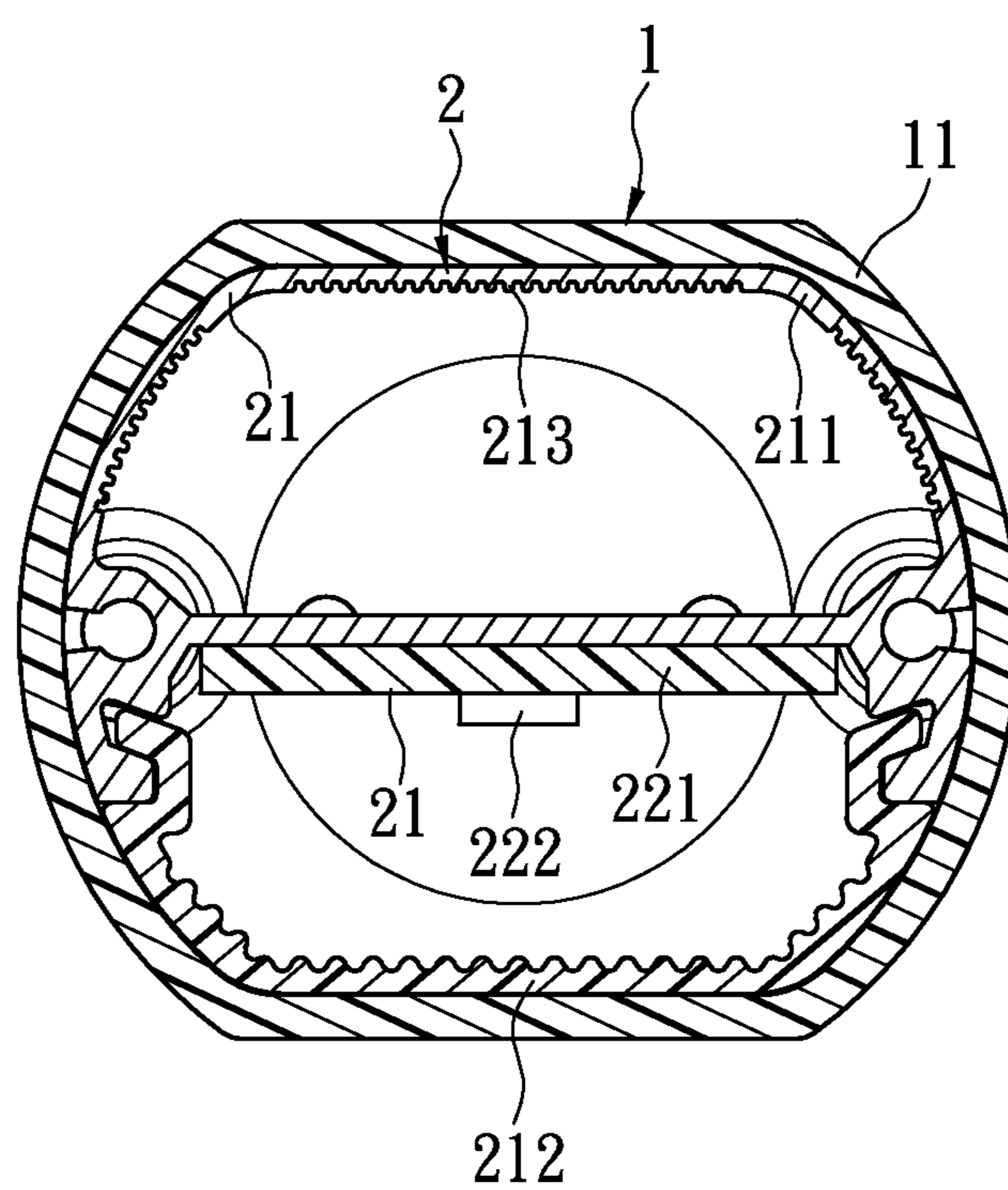


FIG. 4

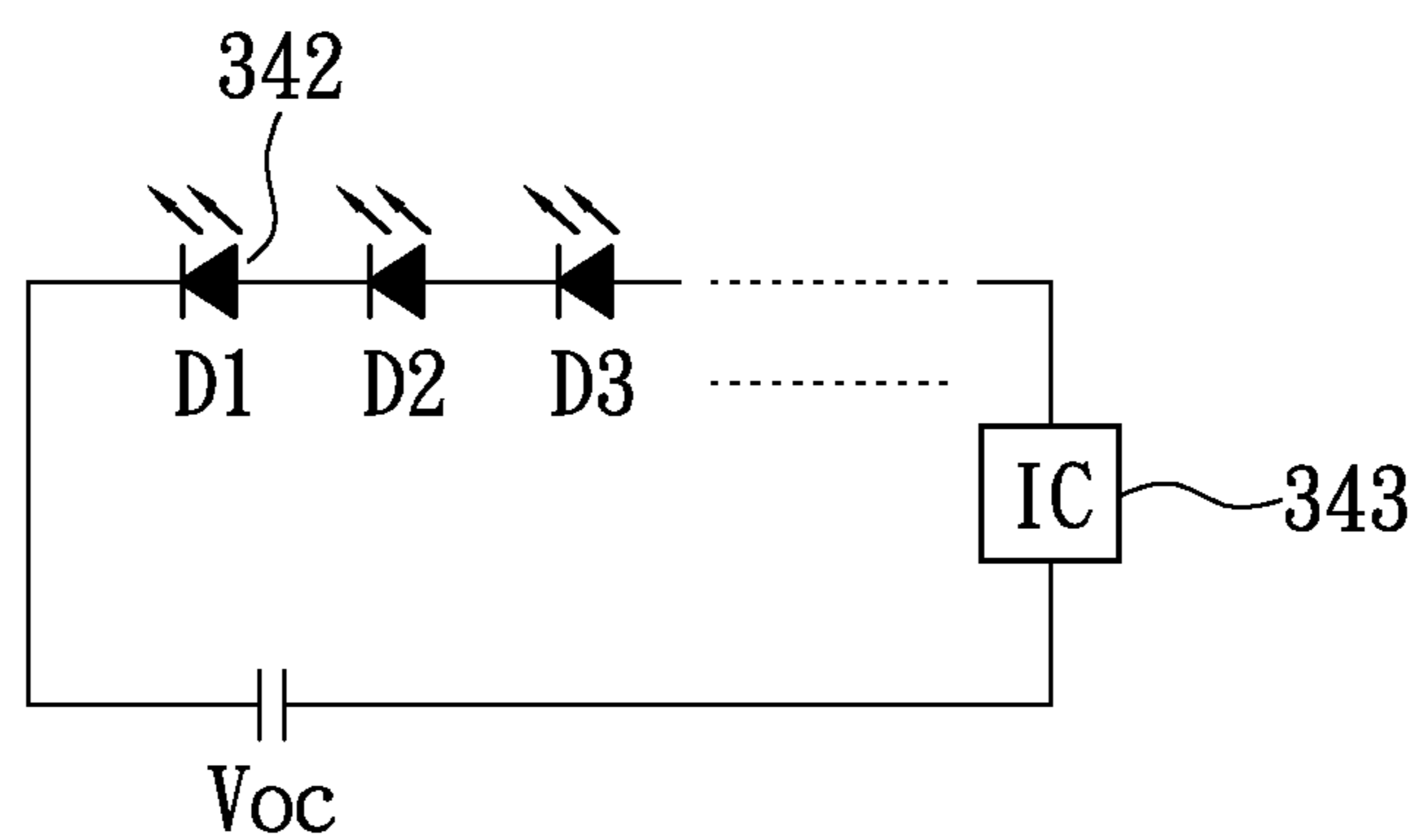


FIG. 5A

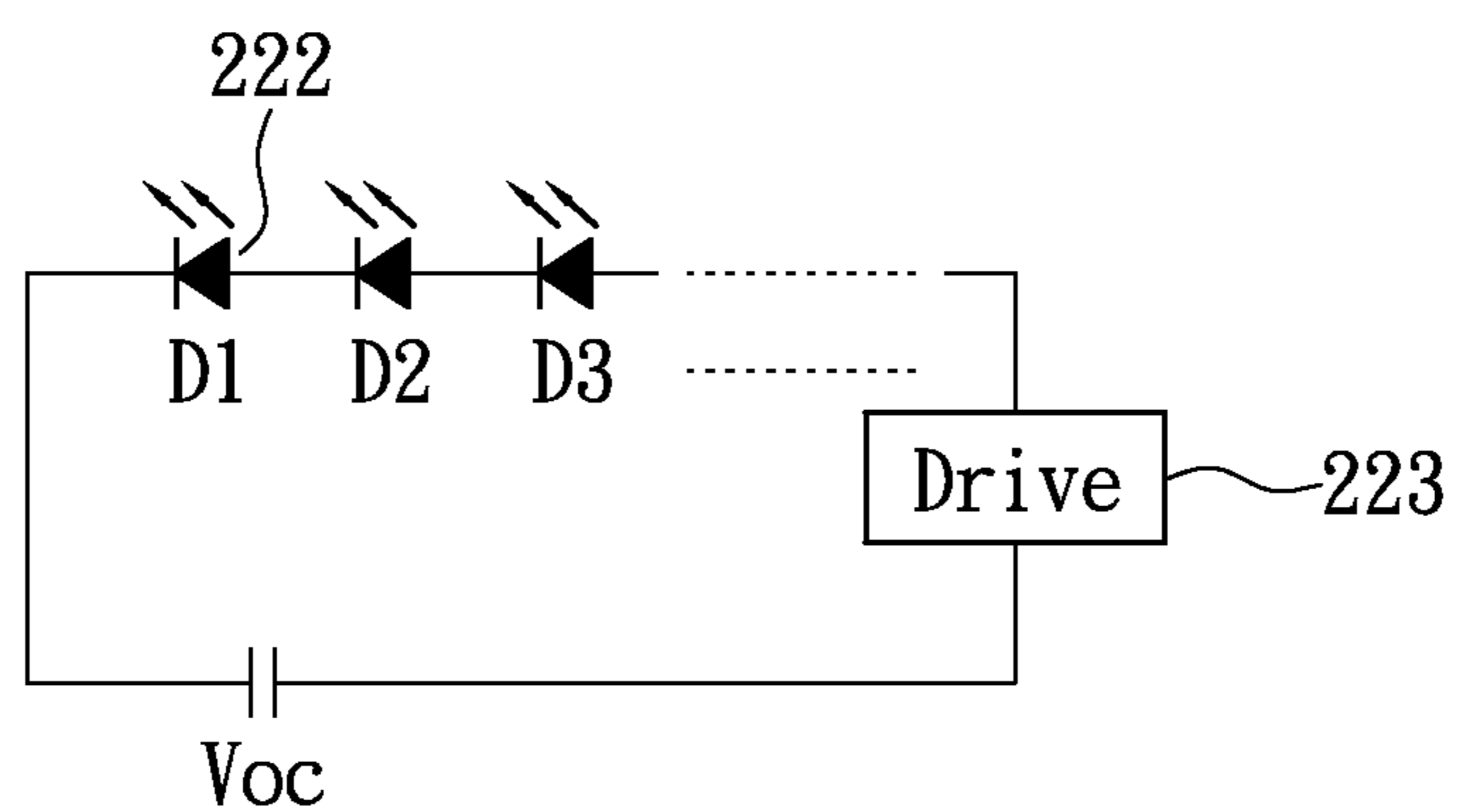


FIG. 5B

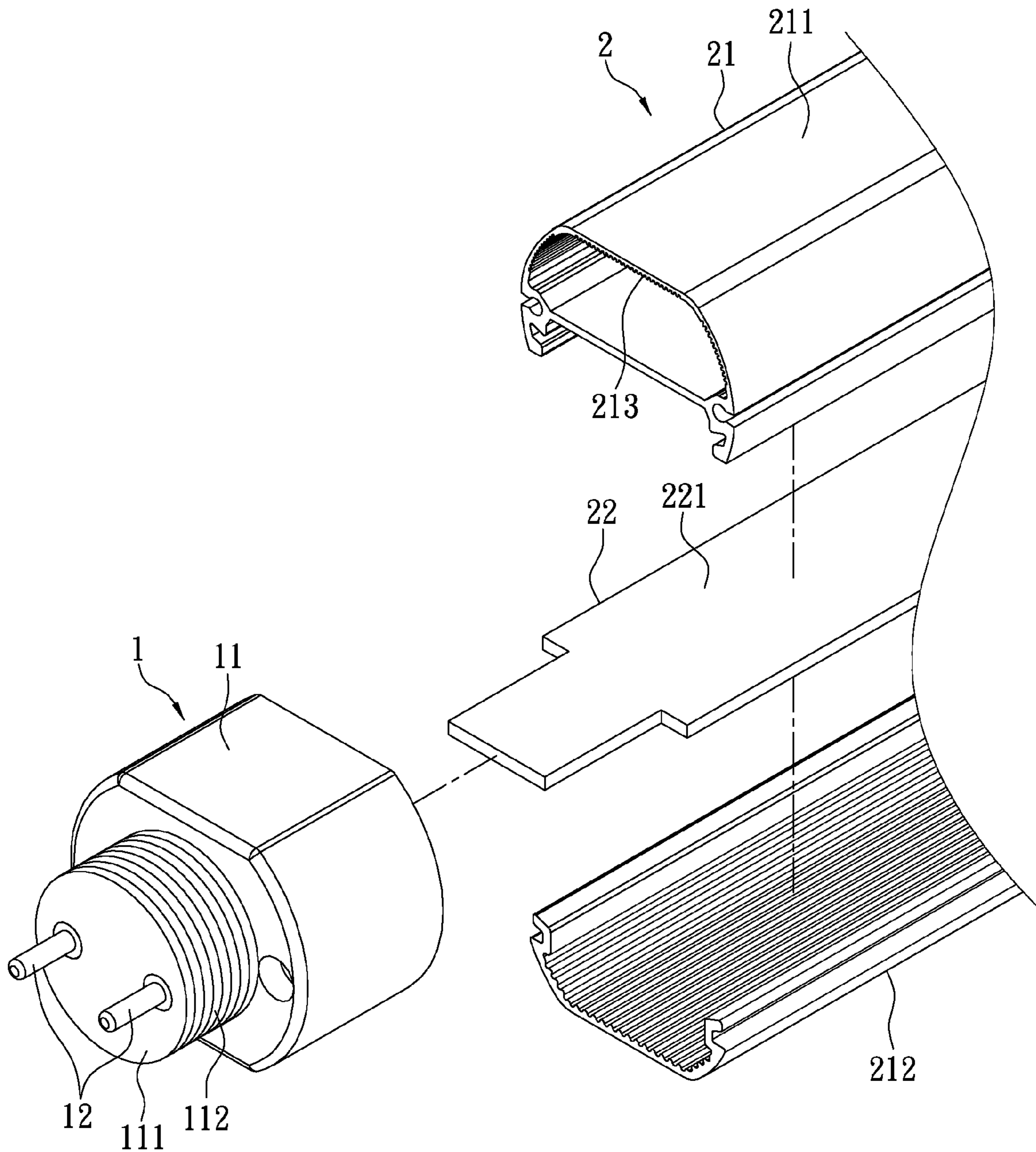


FIG. 6

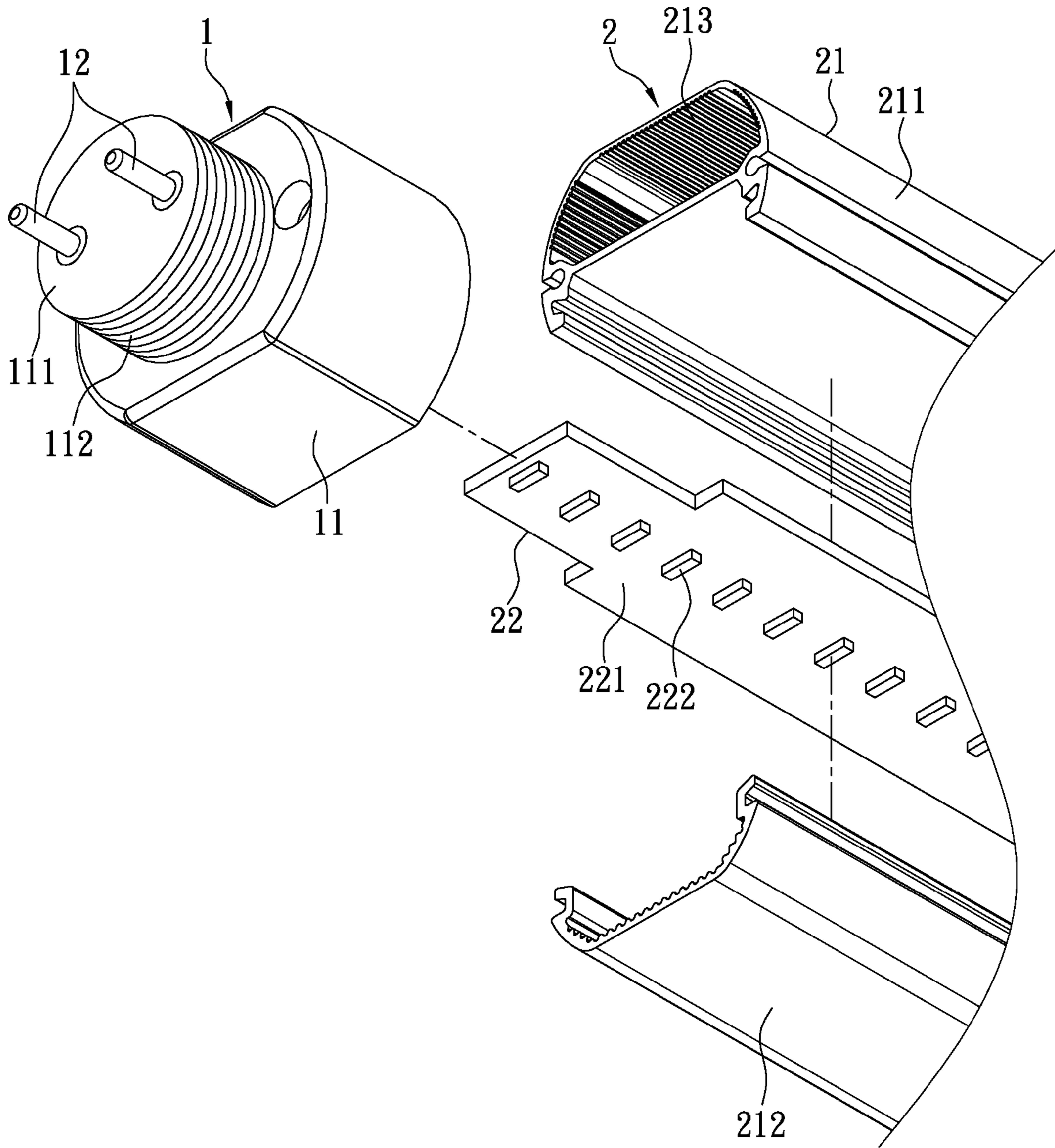


FIG. 7



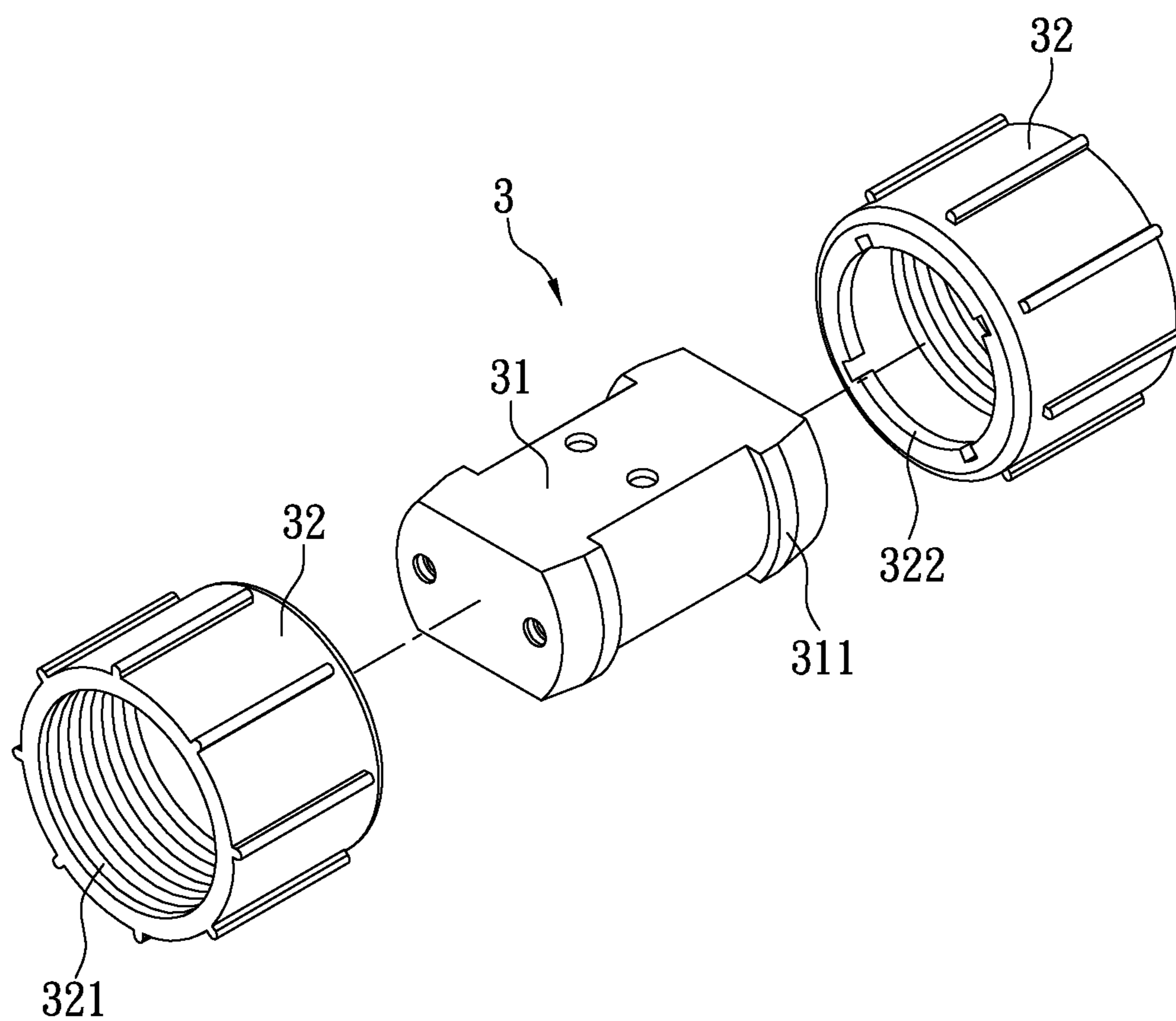


FIG. 8

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## LED TUBE SOCKET, ADAPTOR AND ASSEMBLY THEREOF

### BACKGROUND

#### 1. Field of the Invention

The instant disclosure relates to a Light Emitting Diode (LED) tube; in particular, to a LED tube socket, an adaptor, and an assembly thereof.

#### 2. Description of Related Art

Light Emitting Diodes (LEDs) have gradually replaced the florescent or incandescent lamps because of smaller size, longer life expectancy and low energy consumption. LEDs can be adapted for a great variety of illumination systems.

The conventional LED tube comprises a cylindrical housing, a circuit board, a plurality of LEDs and two adaptors. The cylindrical housing is transparent and the circuit board along with the LEDs is disposed within the cylindrical housing. The adaptors cap the respective ends of the cylindrical housing and are electrically connectable to the circuit board for a complete LED tube.

The length of the LED tube is fixed so a joint system is employed to elongate the LED tube. As shown in TW Pat No. M323559, a fixing and cascading structure for light bar lamps is disclosed which utilizes electric connector to joint each section.

However, the conventional LED tube adaptors cannot be rapidly mounted or dismounted. The connection is relatively unstable and prone to detach from one another. In addition, the seal is not watertight.

Furthermore, after the LED tubes are connected by a plurality of adaptors, the light impermeable adaptor bodies cannot allow light rays through. As a result, the light source becomes discrete due to the adaptor interruption.

To address the above issues, the inventor strives via associated experience and research to present the instant disclosure, which can effectively improve the limitation described above.

### SUMMARY OF THE INVENTION

The object of the instant disclosure is to provide a LED tube socket, an adaptor, and an assembly thereof for connecting more than one LED tube together rapidly and reliably to satisfy a required length. In addition, the instant disclosure provides a watertight connection to protect the LEDs from fluid damage. Moreover, the light source is continuous because the sockets and adaptors are made from transparent materials.

According to one exemplary embodiment of the instant disclosure, the LED tube socket, adaptor and assembly thereof comprise two sockets capping either end of a LED tube. The LED tube includes a cylindrical housing and at least one first LED assembly therein. Each of the sockets has a socket main body, which has a first threaded portion for fastening, and two conductive terminals, which are electrically connectable to the first LED assembly. The LED tube socket, adaptor and assembly thereof further comprise an adaptor which includes an adaptor main body, two rotation fittings and two conducting members. Each of the two rotation fittings has second threaded portion corresponding to the first threaded portion. The rotation fittings connect either end of the adaptor main body. The two conducting members are arranged within the adaptor main body and conforming to the conductive terminal alignment. That is to say, one pair of the conductive terminals is received by conducting members over one side of the adaptor. The first and second threaded portions

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of the adaptor and rotation fittings conformingly fit each another so to enable serial connection of adjacent LED tubes.

The instant disclosure also provides a LED tube socket comprising two sockets capping either end of the tube. The LED tube includes a cylindrical housing and at least one first LED assembly therein. Each of the sockets has a socket main body and a pair of conductive terminals. The socket main body is formed with a first threaded portion protruding outwardly. The pair of conductive terminals is arranged on the socket main body and electrically connectable to the first LED assembly.

The instant disclosure further provides an adaptor which comprises an adaptor main body, two rotation fittings formed with second threaded portion and two conducting members arranged within the adaptor main body. The rotation fittings connect either end of the adaptor main body.

The instant disclosure provides a faster and more reliable connection between two neighboring LED tubes by threads mating. The seal is watertight to prevent from liquid invasion. Furthermore, the sockets and adaptors are made from transparent materials and LED tubes can be disposed within the adaptor main body thus the light source is continuous without interruption.

In order to further understand the instant disclosure, the following embodiments are provided along with illustrations to facilitate the appreciation of the instant disclosure; however, the appended drawings are merely provided for reference and illustration, without any intention to be used for limiting the scope of the instant disclosure.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an exploded view of a LED tube socket, an adaptor and an assembly thereof according to the instant disclosure.

FIG. 2 illustrates a perspective view of a LED tube socket, an adaptor and an assembly thereof according to the instant disclosure.

FIG. 3 illustrates a front cross sectional view of a LED tube socket, an adaptor and an assembly thereof according to the instant disclosure.

FIG. 4 illustrates a side cross sectional view of a LED tube and an adaptor according to the instant disclosure.

FIG. 5A illustrates a circuiting of an adaptor according to the instant disclosure.

FIG. 5B illustrates a circuiting of a LED tube according to the instant disclosure.

FIG. 6 illustrates an exploded view of a LED tube and a socket according to the instant disclosure.

FIG. 7 illustrates an exploded view from another angle of a LED tube and a socket according to the instant disclosure.

FIG. 8 illustrates an exploded view of a LED tube and a socket according to the instant disclosure.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The aforementioned illustrations and following detailed descriptions are exemplary for the purpose of further explaining the scope of the instant disclosure. Other objectives and advantages related to the instant disclosure will be illustrated in the subsequent descriptions and appended drawings.

With reference to FIGS. 1-4. The instant disclosure provides a Light Emitting Diode (LED) tube socket comprising two sockets **1** capping either end of a LED tube **2**. The LED tube **2** includes a housing **21** and at least one first LED assembly **22** (as shown in FIGS. 6 and 7). The housing **21**

includes a holder **211** preferably made from materials having good heat conductive efficiency such as aluminum and a cover **212**. The holder **211** is a hollow cylinder and the structure and dimension thereof are not limited thereto. Option-  
ally, the holder **211** may be formed with a heat dissipation  
portion **213**, which has a plurality of grooves and peaks to  
increase the surface area.

The cover **212** is made from polycarbonate (PC) or the like to appear transparent to the light emitted by the LED tube **2**. In other words, light output generated/emitted from the LED tube **2** is permeable through the cover **212**. The cover **212** preferably has an arced hollow cross-section, although the specific arrangement thereof can differ according to particular design preference or other practice need. The holder **211** and cover **212** are detachably engaged by detents or screws to form the hollow housing **21** for retaining the first LED assembly. The cover **212** envelopes the first LED assembly **22** and the light rays are permeable there-through. Additionally, the holder **211** can be fixed by tapes or clamps to a desired location, such as a wall/ceiling. However, it is worth noted that the cover **212** is not restricted to this particular structure.

The first LED assembly **22** is disposed in the housing **21**. The first LED assembly **22** includes a circuit board **221** and a plurality of LEDs **222** arranged on the circuit board **221**. In one embodiment, the circuit board **221** is an aluminum plate having an elongated shape formed with electrical traces patterned thereon. However, the structure of the circuit board **221** is not restricted thereto. The LEDs **222** are disposed on the circuit board **221** facing the cover **212** by a predetermined distance and electrically connected to the circuit board **221**. The circuit board **221** may further incorporate a LED driver **223** for regulating power (as shown in FIG. 5B). The two sockets **1** electrically connect the first LED assembly **22** and are attached on either end of the housing **21**. In use, electric power is conducted through the socket **1** to the first LED assembly **22**, powering the LEDs to emit light that passes through the cover **212** to the exterior. As an alternative, LED drivers and/or other control circuit components may be arranged externally outside the LED tube **2**.

Each of the sockets **1** has a socket main body **11** and two conductive terminals **12**. The socket main body **11** is made from electrically insulation materials with high light permeability. That is to day, the light source can pass through the sockets **1** instead of being concealed there-from. Moreover, the first LED assembly **22** can stretch into the interior of the socket main body **11**, and therefore the light ray comes out from the entire LED tube **2** as well as the sockets **1**. The socket main body **11** is hollow with one opening and engaged with the housing **21** by detent. The socket main body **11** includes a plurality of first threaded portion **112** protruding from the closed end of the socket main body **11** resembling a coiled pillar. The pair of conductive terminals **12** is made from electrically conductive metals and electrically connecting the first LED assembly **22** by wires at one end, whereas the other end thereof extends from the socket main body **11** to conduct power and connect another LED tube **2**. The power (for example, direct current power) travels through the conductive terminals **12** and is regulated by either internal LED driver or an external controller.

With the reference to FIG. 8. The instant disclosure also provides an adaptor **3**. The adaptor **3** joints two neighboring LED tubes **2** by connecting two sockets **1** from two different LED tubes **2**. Hence, the adaptor **3** allows the LED tube **2** being extendable to a required length. The adaptor **3** includes an adaptor main body **31**, two rotation fittings **32** and two conducting members **33** (as shown in FIG. 3). The adaptor main body **31** is made from electrical insulation materials

with high light permeability so the light rays can travel through the adaptor main body **31** freely. The adaptor main body **31** is a hollow body and locking portion **311** projecting around the edge thereof to position the two rotation fittings **32**.

The two rotation fittings (e.g. lock nut) **32** are made from electrical insulating materials with high light permeability. The rotation fittings **32** are substantially hollow cylindrical with second threaded portion **321** formed on the inner tubular surface thereof. In the instant embodiment, the rotation fittings **32** mates with the first threaded portion **112** of the socket **1**. However, the second threaded portion **321** can also form on the outer wall of the rotation fittings **32** (not shown) and still fittingly mate with the first threaded portion **112**. The two rotation fittings **32** envelope either end of the adaptor main body **31** in an axially mobile manner. The interior edge of the rotation fittings **32** is formed with ridges **322** abutting against the locking portions **311**, which assist in gripping the rotation fitting **32**. When the rotation fitting **32** moves toward the edge of the adaptor main body **31**, the locking portion **311** stops the rotation fitting **32** from dismounting by locking the ridge **322**.

The two conducting members **33** are made from conductive metals and arranged inside the hollow adaptor main body **31**. The conducting members **33** are electrically connectable to a second LED assembly **34**. The conducting members **33** serve as the electrical conductive passage between the conductive terminals **12** and the adjacent LED assembly. In the instant embodiment, the conducting members **33** are tubes conforming to the pair of conductive terminals **12**. Hence the pair of conductive terminals **12** is inserted to the conducting members for serial electrical conduction. Alternatively, each of the conducting member **33** can be divided into two sections (not shown) and arranged respectively on either end of the adaptor main body **31**.

The second LED assembly **34** is disposed within the adaptor main body **31** and including a circuit board **341** and a plurality of LEDs **342** arranged thereon. The LEDs **342** are disposed in a predetermined interval and electrically connectable to the circuit board **341**. The circuit board **341** may have an IC **343** arranged thereon (as shown in FIG. 5A). In the instant embodiment, the second LED assembly **34** emits light rays passing through the light permeable adaptor main body **31** and rotation fittings **32**. If the adaptor main body **31** is not equipped with the second LED assembly **34**, the adaptor main body **31** and rotation fittings **32** can be made from light impermeable materials.

With reference to FIGS. 1~3. The socket **1** and adaptor **3** are electrically connected by the conductive terminals **12** via the conducting members **33**. More specifically, the conductive terminals **12** electrically contact the conducting members **33** to allow electric current passing between the socket **1** and adaptor **3**. The rotation fittings **32** engage with the socket **1** by mating the first and second threaded portions **112**, **321** to secure the mounting of the socket **1** and adaptor **3**. Similarly, the free end of the LED tube **2** connects to another adjacent LED tube **2** in an identical way. In addition, the LED tubes **2** can be in parallel circuit connection. Furthermore, a gasket or O-ring (not shown) is disposed between the adaptor **3** and the socket **1** to support watertight enclosure.

In summary, the LED tube **2** can be fast mounted onto the adaptor **3** by the first and second threaded portions **112**, **321** to satisfy a required length in serial connection. In addition, the seal between the first and second threaded portions **112**, **321** are watertight to prevent from liquid damage. Furthermore, the second LED assembly **34** can be disposed within the

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adaptor main body **31** to enable the light rays passing through the transparent adaptor **3** and providing a continuous light distribution.

The descriptions illustrated supra set forth simply the preferred embodiments of the instant disclosure; however, the characteristics of the instant disclosure are by no means restricted thereto. All changes, alternations, or modifications conveniently considered by those skilled in the art are deemed to be encompassed within the scope of the instant disclosure delineated by the following claims.

What is claimed is:

**1.** A light emitting diode (LED) tube socket, adaptor and assembly thereof comprising:

a LED tube including an elongated housing and at least one first LED assembly;

two sockets respectively arranged on each end of the LED tube, each of the sockets including:

a socket main body having a first threaded portion;

a pair of conductive terminals arranged on the socket and electrically connecting the first LED assembly; and

an adaptor including an adaptor main body, two rotation fittings and two conducting members, each of the rotation fittings disposed on the adaptor main body and having a second threaded portion, the conducting members electrically connecting the first LED assembly;

wherein the pair of the conductive terminals are conformingly inserted into the conducting members and two adjacent LED tubes are engaged by mating the first and second threaded portions;

wherein the socket main body is light permeable and the first LED assembly extends to the interior thereof.

**2.** The LED tube socket, adaptor and assembly thereof according to claim **1**, wherein the rotation fittings axially and rotatably move along the adaptor main body and engage thereto.

**3.** The LED tube socket, adaptor and assembly thereof according to claim **1**, wherein the first threaded portion protrudes outwardly from the socket main body and mates with the second threaded portion of the adapter main body.

**4.** The LED tube socket, adaptor and assembly thereof according to claim **1**, wherein the adaptor main body is

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formed with a locking portion around the edge thereof and each of the two rotation fittings is formed with a ridge corresponding to the locking portion.

**5.** A light emitting diode (LED) tube socket, adaptor and assembly thereof comprising:

a LED tube including an elongated housing and at least one first LED assembly;

two sockets respectively arranged on each end of the LED tube, each of the sockets including:

a socket main body having a first threaded portion;

a pair of conductive terminals arranged on the socket and electrically connecting the first LED assembly; and

an adaptor including an adaptor main body, two rotation fittings and two conducting members, each of the rotation fittings disposed on the adaptor main body and having a second threaded portion, the conducting members electrically connecting the first LED assembly;

wherein the pair of the conductive terminals are conformingly inserted into the conducting members and two adjacent LED tubes are engaged by mating the first and second threaded portions;

wherein the adaptor main body and the two rotation fittings are light permeable, and a second LED assembly is disposed within the adaptor main body and electrically connecting the two conducting members.

**6.** The LED tube socket, adaptor and assembly thereof according to claim **5**, wherein the rotation fittings axially and rotatably move along the adaptor main body and engage thereto.

**7.** The LED tube socket, adaptor and assembly thereof according to claim **5**, wherein the first threaded portion protrudes outwardly from the socket main body and mates with the second threaded portion of the adapter main body.

**8.** The LED tube socket, adaptor and assembly thereof according to claim **5**, wherein the adaptor main body is formed with a locking portion around the edge thereof and each of the two rotation fittings is formed with a ridge corresponding to the locking portion.

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